A.W. Marshall
D. Ellsberg

John Williams is giving dry-run of 'banquet-level talk' on "Toward Intelligent Machines" at 12:15 today (Wednesday, December 21st) in the Main Conference Room.

Care to attend?

I	a	a	b	b
II	b	b	a	a
III	a	b	b	b
IV	b	a	b	b
V	b	b	a	b
VI	b	b	b	a

Given:

I : II

III : IV

V : VI

Post 1 + 2

Suppose IV > V

i.e. IV b a b b ↓ (is preferred to)

V b b a b

---

b a b a ↓

b b a a

---

b a b a ↓

a a b b

---

b b b a ↓

a b b b

---

b b a b ↓ contradiction

b a b b

$r = 0 \quad — (U_{11} - U_{21}) = 0$

$r = 1 \quad — (U_{22} - U_{12}) = 0$

$(p - r) \sim T$ (tension)

US II, SU I

$$P_{US} - \frac{U_{11} - U_{21}}{(U_{11} - U_{21}) + (U_{22} - U_{12})} \geq 0$$

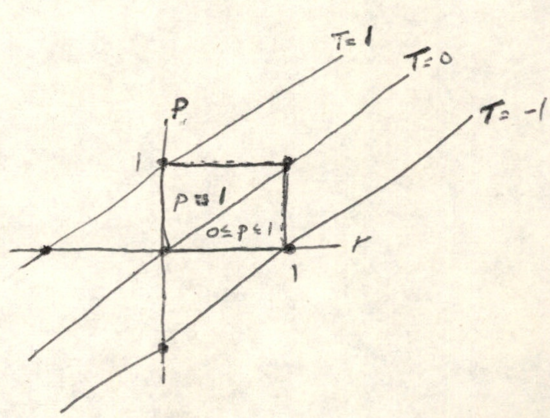
SU II, US I

$$P_{SU} - \frac{U_{11} - U_{21}}{(U_{11} - U_{21}) + (U_{22} - U_{12})_{SU}}$$

$$P_{SU} = f(T_{US}) = f(p_{US} - r_{US})$$

$f' > 0$

$R = 1 \Leftarrow p_{US} - r_{US} > 0$



Liniwill

SU dead on SU first strike — $(p-r)_{SU}$ — SU Type II, US Type I

US dead on US first strike — $(p-r)_{US}$ — US Type II, SU Type I

$$p - \frac{U_{11} - U_{21}}{(U_{11} - U_{21}) + (U_{22} - U_{12})} \quad (US) \quad \text{Type II}$$

(U_{21}: US dead on first strike)

(2) a b b a P2

b b a a

---

(3) a b b a

a a b b P1

---

b b b a

b a b b P2

---

b b a b P1

a b b b

a b b b

b b a b

b b a b

a b b b

a a b b

b a a b

a a b b

a b a b

b b a a

b a a b

b b a a

a b a b

b a b b

b b a b

o b b a

a b b b

b b a b

a b b b

Savage:

.01	.1	.89
1	1	1
0	2	1
1	1	0
2	2	0

HK example:

	.09	.1	.81
→	1M	1M	1M
	2M	0	2M
	0	1	0
→	2	0	0

Suppose U(1M) = 100, U(2M) = 120, probs ambiguous

$.09^+ - .04$	$.05 - .1^+$	$.7 - .81^+$	Est	Min	$\rho = \frac{1}{2}$
100	100	100	100	100	100
120	0	120	108	88.4	98.2
0	100	0	10	5	7.5
120	0	0	10.8	4.8	7.8

120
.74
480
840
88.80

120
.9
10.8.0

120
.04
4.80

108
88.4
2 | 196.4
98.2

10.8
4.8
2 | 15.6
7.8

	20-50	10-40	Min
-6	-6	0	-5
0	0	-12	-8

(Reject notion that "utilities" can have changed in ambiguous situation.)

Hyp: that people whose initial response is to disobey axioms and who don't want to obey axioms, probably don't obey axioms.

~~Why~~ ~~F~~ Fellner assumes people act in ambiguous situations as though they attached weights to payoffs which were independent of payoffs: which depended only on relative likelihoods and ~~[illegible]~~ "degree of confidence". Can't explain actual behavior.

(He "catches" them by first measuring certain probs in situation where they do obey axioms, then compares behavior in ambiguous situation; I don't. If you do it his way, can also measure utilities, use this data.

He doesn't make operational, behavioral tests clear.

Shouldn't measure "utilities" in situations when it's not clear that you have probs).

Stress nature of ambiguity.
Quote on wishful thinking.
Relation to Reluctant Duellist - wishful. Relation to games.
~~[illegible]~~ Go back to Shackle quote.
50-50 "probs" or not

	4	T
I	10	0
III	4	4
	0	10

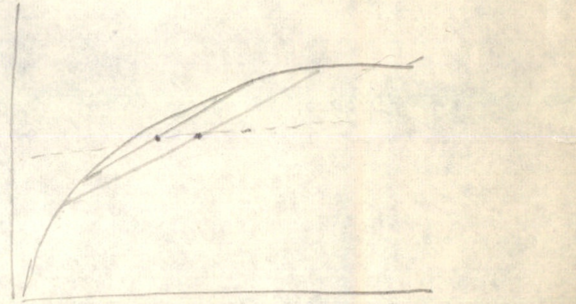
	$\frac{1}{2}$($\frac{1}{2}$R	$\frac{1}{2}$B
II	10	0
	3	3
	0	10

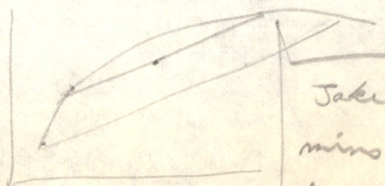
Would player pay as much for II as for I? Why not? I : III when weights are symmetric ($\frac{1}{2}$:$\frac{1}{2}$; $\frac{1}{3}$:$\frac{1}{3}$; $\frac{1}{4}$:$\frac{1}{4}$; etc); why should they not be equivalent when wts are ambiguous but symmetric? Ans: because weights for payoffs depend not only on amount of info but on payoffs.

3	-3	6
-3	3	6

6	-6
-12	12

6	-6	0
-6	6	0
-1		





	4	T
	$10	-8
	-15	-20

10-40	10-40
-10	12
25	-20

10-40	40-10	Min	Max
-10	10	-6	6
20	-20	-12	12

Take two strats with sharply differing mins and maxes, which are equivalent for 50-50 bet. Are they equivalent for symmetric-ambiguous bet? (No need to compute utilities).
Ratios "of probs" are the same; both involve "participation in gamble"; in second case, "correction factors" are the same for both strats — assuming correction factor depends only on info about probs, not on payoffs.

4

"The Gamble With Death in Attempted Suicide"
James M. A. Weiss. Psychiatry, Vol. 20, Feb '57 No. 1 pp. 17-25

"Many suicidal attempts have at least in part the character of a gamble with death, a sort of Russian roulette, the outcome of which depends to some extent on chance ... the lethal prob. may vary from almost certain survival to almost certain death, and 'fate' — or at least some force external to the conscious choice of the person — is compelled in some perhaps magical way to make the final decision." p. 21

["True suicide attempts" — person thinks there is some chance of dying, some chance of living] [Most attempts]

This "serves to discharge aggressive tendencies directed against the self or against introjected parental figures — that is, the superego." Improvement follows. "the patients felt that in the attempt itself, and in the associated gamble with death, they were punished for whatever acts committed or fantasies entertained had contributed to the feeling of guilt." p. 23

the gamble is the atonement. A child's confession is a gamble (& atonement).

Effects of game elements and lack of confidence in probs on subjetive probs:

1. Because of payoffs and outside information, some of opponent's strats are eliminated as impossible.

2. ~~Re~~ Because of lack of confidence in probs over remaining strats:
a) minimax, minimax regret, Hurwicz, etc.
b) eliminate your own strats that has "too low" a minimum, then maximize against subjective probs.
c) decide what would be the critical prob that would decide choice, if believed; then gather evidence, look deeper into your heart, etc. to determine that prob, relative to the critical point, with high confidence. Wohlstetter

3. Create a good basis for judging opponent's expectations by influencing them in predictable ways (so as to "wash out" his initial position); a) change payoffs; b) in early plays, follow a pattern; c) let out additional information; d) "give up" certain strategies irrevocably, by operating on your own payoffs (in a zero-sum game, could give up minimax strat). Schelling

4. Distort the subjective probs, either column by column or inside each row (Hurwicz) in a way depending on payoffs; pessimist will increase prob of bad, optimist of good (Which is Russia? This is the key question indeciding whether to leave our threats uncertain.)

MAIN EFFECT OF UNCERTAINTY AND LCAK OF CONFIDENCE: DISAGREEMENT, DIVERSE REACTIONS

Don,

I'd like to talk a little further about these.

Ken

In general, as one ponders these postulates and "tests" them introspectively in a variety of hypothetical situations, they do indeed appear "plausible": in the sense that one rarely makes careful choices that violate them, and the occasional violation tends to be eliminated after further consideration. That is to say that they do seem to have wide validity as normative criteria (for me, as well as for Savage

100		100		
R_I	B_I	R_{II}	B_{II}	
a	b	b	b	
b	a	b	b	?
b	b	a	b	?
b	b	b	a	
a	a	b	b	
b	b	a	a	

The basic operation in the Ramsey–Savage approach is illustrated by the following choice-situation, where I and II are two *actions* ("gambles"), α is an *event* and $\bar{\alpha}$ its complement, and a and b are two *outcomes* (e.g. $100 and $0) such that the person prefers a to b.

	α	$\bar{\alpha}$
I	a	b
II	b	a

Intuitively, since both actions offer the same two possible outcomes, we would expect the person's choice to be influenced, not by the relative "utilities" of these outcomes but only their relative likelihood; i.e. he would pick the action which seemed to him to offer the higher chance of *a*. His choice would thus reveal whether he regarded α or $\bar{\alpha}$ "more likely"; and this choice should be independent of the actual values of a and b, so long as a is preferred to b.

Axiomatically, if the person prefers I to II, and if this preference holds for *any* *a*, *b*, such that a is preferred to b, this may be interpreted to mean that he regards α as more probable than $\bar{\alpha}$, "more likely than not." Action I here amounts to a bet "on" α, and II to a bet "against" α. It seems (to correspond to common usage) to say that if a person prefers to bet "on" α rather than "against" it, he regards α as "more likely than not."

~~Episodes~~

To infer probabilities among events which are not necessarily complements, ~~one~~ a number of constraining postulates on choice must be satisfied. To simplify exposition, let us consider only ~~the~~ an exhaustive set of events α, β, $\bar{\alpha} \cap \bar{\beta}$; ~~and outcomes such that a is preferred b;~~ the relationship $\leq$ among acts or outcomes will mean "is not preferred to."

Savage's Postulate 1 is: ~~The relation~~ ~~$\leq$ is a simple~~ There is a ~~simple~~ complete preference ordering (≤) ~~among~~ of all acts ("gambles"). (p. 18). In other words, a person can say of any two acts I and II either that I ≤ II or II ≤ I; and if I ≤ II and II ≤ III, then I ≤ III. (Note: this postulate alone rules out the decision rule, earlier christened by Savage, of "minimaxing regret.")

Savage's Postulate 2 is what he calls the "Sure-Thing Principle." It is crucial to the approach and, (like Postulate 3, not discussed here) is related in ~~the spirit~~ spirit to the game-theoretical notion of "admissibility," the rejection of "dominated" strategies. "Except possibly for the assumption of simple ordering," Savage reports, "I know of no other extralogical principle governing decisions that finds such ready acceptance." (p. 21).

In words: "

Kaufman:

Formally:

	α	β	$\bar{\alpha} \cap \bar{\beta}$
		$\bar{\alpha}$ (spanning β and $\bar{\alpha} \cap \bar{\beta}$)	
I	a	c	d
II	a	e	f
III	b	c	d
IV	b	e	f

P2: If I $\leq$ II, then III $\leq$ IV, for any $\underline{a}$, $\underline{b}$.

~~The relation to the notion of "admissibility"~~

The rationale for this principle might be phrased as follows: Suppose that the person "knew" that $\bar{\alpha}$ would "obtain" (α was "impossible") he would not prefer I to II (likewise, III $\leq$ IV). If, on the other hand, he knew that α would obtain ($\bar{\alpha}$ impossible), he would still not prefer I to II (or III to IV), since their outcomes are equal; and this should not depend on the value of the equal outcomes. Hence, since he would not prefer I to II "in either event" (α or $\bar{\alpha}$), he should not prefer I to II (or III to IV), not knowing which event will obtain.

Another ~~A third~~ postulate (Savage's P4) serves to define "qualitative personal probability." Basically, it amounts to the condition mentioned earlier: ~~that~~ "the assumption that on which of two events the person will choose to stake a prize does not depend on the prize itself." (p. 31)

From now on, to say that "a bet ~~prize~~ is offered on event α" is to say that ~~the person is~~ an act is made available to the person with the outcome a if the event α "occurs" ("obtains") and $\underline{b}$ if it does not obtain (i.e. if $\bar{\alpha}$ obtains), with $\underline{a}$ preferable to b.

~~Identify a, b, be $100 [illegible]~~

We may illustrate this (with a preferred to b, c to d):

	α	β	$\bar{\alpha} \cap \bar{\beta}$
I	a	b	b
II	b	a	b
III	c	d	d
IV	d	c	d

P4: if $I \leq II$, then $III \leq IV$ (for all a, b, c, d, with $a > b$, $c > d$).

If this postulate applies to all the individual's relevant choices, then if ~~and only if~~ in a choice between two actions with outcomes such as I and II, the person indicates that $I \leq II$, it will be concluded that ~~[illegible] $\alpha \leq \beta$~~ α is considered "not more probable than" β $(\alpha \leq \beta)$.

These three postulates are ~~[illegible] "crucial" [illegible]~~ are the ones upon which we will focus. ~~(There are ~~those~~ four others necessary to rule out ~~[illegible]~~ "troublesome" phenomena, ~~and~~ to permit numerical determination of probabilities, and to determine numerical utilities).~~ Together with one other (which I omit here as "non-controversial") they permit ~~[illegible]~~ determination of well-defined "qualitative probabilities," on the basis of the rule above. That is, if a person's choices among gambles satisfy these conditions, the relationship $\leq$ among events inferred above will have the properties of a qualitative probability relationship. (Three other postulates are required to permit numerical determination of probabilities and utilities.)

Let us consider first what we mean by a "qualitative probability relationship" between events (See Savage, p. 32). ~~If $\leq$ denotes the relationship, "not more probable than," and α, β, γ are events, and $\bar{\alpha}$ means "not-α", or the complement to α, then~~ The relation $\leq$ between events is a qualitative probability, if and only if, for all events α, β, γ:

1) $\leq$ is a simple ordering.

2) $\alpha \leq \beta$, if and only if $\alpha \cup \gamma \leq \beta \cup \gamma$, provided $\alpha \cap \gamma = \beta \cap \gamma = 0$, (where 0 is the 'null event', roughly, an event considered 'certainly impossible')

3) $0 \leq \alpha$, $0 < S$ (where S is the "universe" of events).

Satisfying these conditions, $\leq$ can be interpreted as the relation "not more probable than," and it will have a number of ~~suitable~~ properties (suitable to this interpretation). For example, it follows from these conditions that if $\alpha > \beta$, then $\bar{\beta} > \bar{\alpha}$; i.e. if α is "more probable than" β, "not-α" is "less probable than" "not-β." ~~Similar~~ Moreover, if $\alpha < \bar{\alpha}$, and $\beta > \bar{\beta}$, then $\alpha < \beta$; and if $\alpha = \bar{\alpha}$ and $\beta = \bar{\beta}$, $\alpha = \beta$. (If α is "less likely than not," and if β is "more likely than not," then α is less likely than β; and if both α and β are "as likely as not," they are equally likely.) Thus, the relationship has more structure than a simple ordering over events; intuitively, these conditions ~~correspond~~ are related to the requirement that if the "probability" of some events ~~goes up~~ is "high", the "probability" of some other must ~~go down~~ be "low."

Now, what empirical operations (what observable results) are to establish this relationship among events, for a particular person?